SmartPulseHD

What is it?
How does it work?
Why did we do it?
How will it help your measurements?

3 Doppler Water-Profiling Techniques

- Pulse-Coherent (1 flavor)
  - Highest precision possible
  - Requires high-level of ambiguity resolution for practical use
  - High percentage data capture
- Broadband (multiple flavors):
  - Precision dependant on specific pulse settings
  - Requires high-level of ambiguity resolution
  - Low percentage data capture – primarily due to side-lobes in shallow water
- Incoherent (1 flavor)
  - Lowest precision – increases with frequency and ping rate
  - Highly robust – no ambiguity resolution required.
  - Highest percentage of data capture

SmartPulse^{HD} Overview

An intelligent way of using multi-frequency acoustics, pulse-coherent pings, incoherent pings, and broadband pings to automatically provide the highest resolution current profiling possible in the given conditions.

RiverSurveyor – SmartPulse^{HD}

Smart: Its an intelligent algorithm that looks at water depth, water velocity and turbulence and adapts the pulse scheme to those conditions

Pulse: It uses Multi-frequency, Pulse-Coherent, Broadband, and incoherent together automatically to provide the highest resolution possible

HD: "High Definition" – just like your TV, this lets customers see the clearest velocity picture possible with cell sizes down to 2 cm

How it works for the RiverSurveyor (Basics)

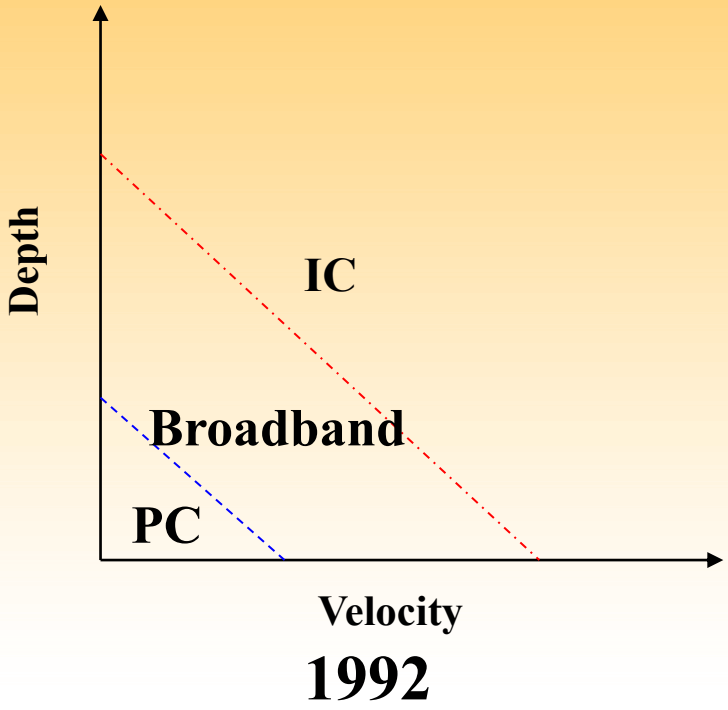
- We continuously track boat motion and water depth using both bottom tracking and the vertical beam.
- We also continuously monitor the velocity of the water relative to the boat.
- Based upon the measured water velocity and water depth, the optimum processing configuration is selected.

1. Always send 3-Mhz and/or 1-Mhz incoherent water-profile pings.
2. If in range, use pulse-coherent ping for water-profile. Can be either 2-cm (3-Mhz) or 6-cm (1-Mhz).
3. A third ping-type is used for ambiguity resolution and will use either 3-Mhz or 1-Mhz frequency and three available ping types (Pulse-coherent, Broadband, Incoherent).

Advantages – How can we do it?

- Hardware and Architecture
  - Powerful CPU collects and processes data simultaneously.
  - Multi-frequency transducers allow for simultaneous pings using 3 techniques for water-profiling and ambiguity resolution.
  - Best solution is selected automatically ever second.
  - Greatly increases Pulse-Coherent range (depth/velocity) and resolution.

PC, Broadband, IC – General Water-profile Performance Thresholds
(for a given operating frequency)



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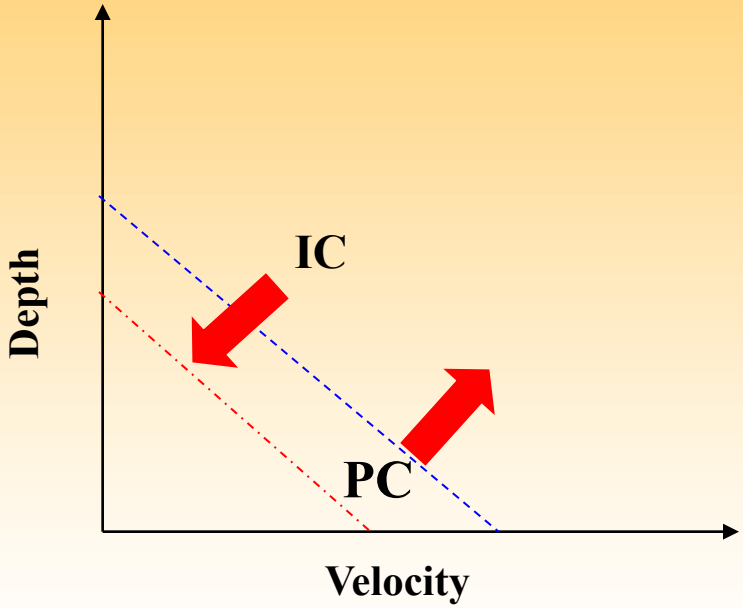
- Slow electronics limit IC ping rate
- Broadband operation function of manual settings
- PC limits on practicality due to poor data checking



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- Electronics sample IC at the limits of physics increases precision
- Broadband operation best used for checking PC data
- Multi-frequency and faster CPU greatly increases PC range